

Missouri Resources Magazine

Fall 1999

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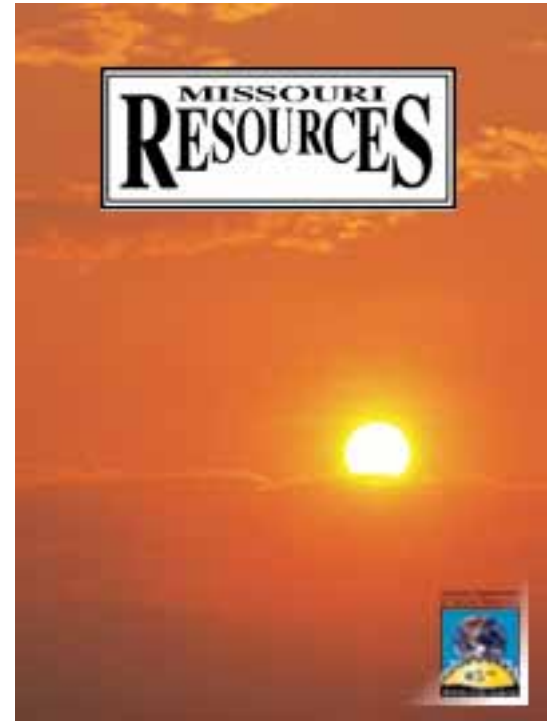
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FRONT COVER: A Missouri sunrise symbolizes a new era for solar energy applications.

BACK COVER: This functional windmill at Steve Truitt's Miller County farm was rebuilt from the ground up.

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Comments from the Director:

At its heart, the Missouri Department of Natural Resources is an environmental agency. We strive in partnership with citizens to protect and preserve our environment in the present and for the future. We advocate choices that safeguard our land, water and energy resources, so that future generations of Missourians can enjoy them as we do.



None of this is news to most of you. You know this agency and you are familiar with the type of work that we do.

Even with that in mind though, you still may wonder why energy resources are included in our environmental focus? That is a good question, and the simple answer is that you cannot talk about the environment without talking about energy. Most of our environmental issues involve production, generation and use of energy.

Energy is what we use to accomplish goals in our society and our personal lives. It is at the core of our economy, the underlying infrastructure that makes it possible to accomplish our dreams. Energy powers the tools that make us productive. It provides comfort at home and at work. It allows us to communicate with each other over long distances. It allows us to be a mobile society.

Without harnessing energy, we would still be cowering in dimly lit caves, believing that the edge of the earth was just over the horizon.

Let us face the facts. Human activity impacts our environment. Even with the best intentions, many of our activities inevitably lead to pollution, most often through the kinds and amounts of energy that we use. With wisdom, our energy choices can make a difference in resolving the environmental problems with which we must contend, both today and in the future.

I strongly believe that energy plays a central role in the environment and our future, and because of this, Missouri needed an advocate to champion the energy needs of our state. That is why I felt the creation of a Missouri Energy Center was so important. I place a lot of importance in the department's Energy division, and I believe it has played a vital role in our efforts to reach the state's environmental goals. Through this part of our workforce, we focus on helping Missouri citizens use energy wisely and explore the use of renewable energy in all of their activities.

Through an effort that involved internal planning and a high level of public input, our Division of Energy recently set priorities that will lead it into the next millennium. By the time you read this, we will have reorganized the division so that we can serve Missouri citizens better as the Missouri Energy Center. We will have reorganized around the most important sectors within the division - schools and local government,

residential needs, business and industry and state government - and we will increase our direct contact in these areas.

A wise man once answered the question, "What's in a name?," by saying, "Just about everything we do." We plan to change the division's name to one that better reflects its customer-service oriented focus. The new name will reflect DNR's role as the center of energy information, assistance and expertise. We also intend to place employees focused on energy issues in our state's metropolitan areas so that we can increase our level of service to urban constituents.

Finally, as part of our effort to focus on public service, will organize an Energy Advisory Council that can serve as a link for public input, recommendations and feedback on state energy policies and programs.

As you read this quarter's magazine with its focus on energy issues, I want to thank you for your support of the department as we strive to protect Missouri's environment through prudent energy choices. If we keep the end goal in mind, we will succeed in maintaining and improving our environment.

As my uncle, Yogi Berra, once said, "You've got to be careful if you don't know where you're going, 'cause you might not get there."

Enough said!

A handwritten signature in black ink that reads "Steve Mahfood". The signature is written in a cursive, flowing style with a large initial "S" and a prominent "M".

Steve Mahfood
Director, Missouri Department of Natural Resources

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ENERGY: THE LAST 25 YEARS

During 1999, the Missouri Department of Natural Resources (DNR) continues to celebrate its 25th anniversary. In commemoration, Missouri Resources has been presenting a "retro look" at four areas of interest and importance to Missouri citizens.

Our spring and summer issues covered air and land resources, respectively. The third part of our agency's natural resource retrospective takes a look at the fastest changing - and often most elusive natural resource - energy.

New technologies good for environment, economy

by Jim Muench
Division of Energy

In 1977, when President Jimmy Carter formed the U.S. Department of Energy, he told the nation that energy conservation was "the moral equivalent of war," highlighting the vital importance of our foreign oil supply to our national security.

It still is vital. Twenty-five years after the first oil shock, Missouri still relies on fossil fuels as its chief source of power. Ninety-four percent of Missouri energy consumption still comes from fossil fuels, 5 percent less than in 1975.

Energy use relates directly to the health of our environment through the quality of our air, water and land. It also relates to the health of our economy, which relies on dependable power to function. By using energy more efficiently and choosing energy alternatives that lessen our reliance on the burning of fossil fuels, we generate fewer harmful emissions.

We also are rewarded with lower energy costs. At the same time, increasing energy efficiency and supporting renewable energy sources help the economy grow as demand leads to new technologies, industries and jobs.

Most of the fossil fuels we use in Missouri - mainly oil and coal - come from other states and foreign countries. While there is nothing inherently wrong with sending our energy dollars overseas, choosing a path that keeps the money in Missouri might be a wiser long-term investment.

New technologies available today and in the next few years may transform the way we generate and use energy. Missouri has the potential to play a leadership role in bringing such new industries to our state - from solar, wind, and biomass to hydrogen fuel cells that would create electricity without harmful emissions. One day, individual Missourians may even become net producers of energy, creating power on-site and supplying power to the electricity grid.

Each state has its own needs in managing the relationship between energy use, environment and economy. In Missouri, DNR's Division of



Long trains of coal, imported from western states, are a common sight in Missouri. Power plants in the state will burn nearly 30 million tons of it this year

Division of Environmental Quality

Energy helps to formulate new possibilities by encouraging energy efficiency and facilitating the changeover to renewable technologies. The division originally was formed as the state's Fuel Allocation Program in answer to the energy crisis of 1973 and has helped manage Missouri's energy needs for a quarter of a century.

In 25 years, much has changed, but much remains the same. Missouri still relies on fossil fuels that harm the environment and relinquish control of our energy supply to others. Alternatively, Missouri could lead the rest of the country in developing and implementing promising new energy technologies in the 21st century.

Connections: energy and air pollution
by Kerry Cordray

Making a quick spin of the dial in your time machines, journey back with us to 1975. The Organization of Petroleum Exporting Countries (OPEC) oil embargo was just a few years ago. Long lines at the gas pumps are still fresh in the minds of many people. But gas seems plentiful now, and vehicles will drive more than 30 billion miles on Missouri roads. Something new is happening this year at the gas pumps; they now are beginning to offer unleaded gasoline. Some new car models have a brand new feature called a catalytic converter. We're seeing new technology in our homes and offices, too. More and more of our appliances, tools and toys are being powered by electricity.

Missouri power plants will burn nearly 18 million tons of coal this year to keep up with the demand for electric power. Our appetite for fossil fuel is not without its cost.

Summertime formation of ground-level ozone (smog) reaches unhealthy levels in St. Louis and Kansas City. Health standards for particulate matter are violated in St. Joseph and Kansas City, and harmful levels of carbon monoxide plague St. Louis. A standard for airborne lead will not even be established until 1978, after which we will discover that unhealthy doses can be found near some lead smelters in Missouri.

Now, cruise the time machine forward to the present. We still power our modern lifestyles largely by burning fuels mined or pumped from the ground, and that still results in air pollution. Twenty-five years later, the number of annual vehicle miles traveled on Missouri roads has more than doubled, to 64.5 billion miles. More efficient vehicles have kept the jump in fuel consumption down to a 35 percent increase over 1975 levels. The state's power plants now annually burn more than 30 million tons of coal, little of which comes from Missouri mines.

In twenty-five years, we've solved some air quality problems, but others remain. Ground-level ozone in St. Louis and Kansas City are lower, but still a problem. Elevated levels of airborne lead are still found near some lead smelters and localized problems can come from facilities that occasionally exceed their emission limits. Most importantly, we now know that the air pollution we cause creates health problems for everyone - young and old, regardless of health.

DNR's Division of Environmental Quality constantly works on solving these air quality problems with solutions ranging from the June 1999 introduction of cleaner-burning gasoline in St. Louis to the recent introduction of new regulations to control emissions from Missouri's sizable charcoal industry. Other ways we are making progress include ensuring that vapor recovery nozzles at St. Louis area gas pumps work properly; requiring better emission controls at Missouri's lead smelters; and finding numerous ways for businesses and industries to control their sources of air pollution.

These strategies and controls help protect air quality. When combined with individual actions, they can help keep the air clean, conserve energy and save money.

Building Missouri's energy future

Kenneth Seeney

Environmental Improvement and Energy Resources Authority (EIERA)

"Energy is the thread that is woven throughout our society. It keeps us warm in the winter and cool in the summer. It powers our automobiles and runs our factories and businesses. ..."

The opening statement to the Missouri Statewide Energy Study emphasizes the important role energy plays in our everyday lives. "The study laid out a framework for a sustainable future in Missouri," said Peter Dreyfuss, one of the key authors of the 1992 study. The former director of Kansas City's Metropolitan Energy Center, Dreyfuss is currently Deputy Chief of Staff, Office of Energy Efficiency and Renewable Energy at the U.S. Department of Energy in Washington, D.C.

The seven-volume, 800-page report was compiled by EIERA in cooperation with DNR's Division of Energy. The 18-month study, recognized as a national model, called for more energy-efficient state buildings, light rail systems and the development of alternative-fuel vehicles. "The study reflected the vision of the state legislature," said Avis Parman, current EIERA chairman.

In 1982, the Missouri General Assembly passed a law that transferred the Environmental Improvement Authority (EIA) to the Department of Natural Resources. Legislators also added new responsibilities, which included a mandate to seek energy alternatives. Its new name became the Environmental Improvement and Energy Resources



Fuel shortages created havoc for Missourians in the '70s. Prices skyrocketed and supplies dwindled.

Authority.

"Since 1983, the EIERA has supported projects at the local level as well as statewide research projects," said Parman.

Community Assistance

In 1990, the EIERA board approved two grants totaling \$62,000 to assist in the construction of the award-winning STAR II racer (Solar Trans-American Racer) at Neosho's Crowder College.

In 1998, the Van-Far High School Sun Chiefs received \$9,500 to support their solar-powered bicycle project. The high school students competed in races at the national and international level and were recognized for bicycle design.

Educational Activities

In 1991, the Authority produced the Our Fragile Earth series, two 18-minute videos targeting middle school students. One of the videos showed young people how to develop energy projects in their communities. It also shared simple but important ways to have a hands-on impact on energy efficiency - such as turning off the lights when leaving a room.

"Young people are our future and if we want to make a difference, we must invite and encourage them to participate in environmental activities," said Bill Clark, president of the Kansas City Urban League. Dr. Clark was EIERA's chairman in 1991 and also served as a member of DNR's Energy Futures Coalition, a state fact-finding body.

Research Projects

In 1993, the Statewide Energy Study led to another report which was initiated in the Missouri General Assembly through House Concurrent Resolution 16. The Economic Opportunities through Energy Efficiency was a 284-page report that analyzed long-term economic initiatives for improving energy efficiency in newly constructed buildings.

"If the recommendations in the report were followed, the state would realize substantial reductions in energy, electrical and natural gas usage," recalled David Goller, EIERA's chairman in 1993. Goller is a Jefferson City lawyer and a former member of the Cole County Planning and Zoning Commission. Since 1993, the report's recommendations have been the catalyst for important legislation and influenced construction design.

"The EIERA will continue to pioneer and support projects that promote energy efficiency," said Parman. "Energy management initiatives do not require major sacrifices, just smart choices."

Parks and historic sites showcase more than nature and history

by Sue Holst

Division of State Parks

For more than 80 years, state parks and historic sites have preserved the state's most outstanding cultural landmarks and natural features. The facilities in these parks and sites also help showcase how energy can be used efficiently and wisely.



During that same period, support for nuclear power, an alternative to fossil-fuel generated electricity, continued to proliferate in the United States. Construction on the reactor building of Union Electric's Callaway plant progresses in 1979.

state parks. The Division of State Parks and Division of Energy are working together on the renovation of the former Missouri-Kansas-Texas (MKT) depot in Sedalia along Katy Trail State Park. The Division of Energy is supplying funds for ground-source heat pumps as a demonstration project for energy-efficient technology in historic buildings.

Our final issue of this century and first of the next will feature DNR's last "retro-topic" - Water. Our agency's most fragile resource responsibility, water quality, joins water quantity as already universally recognized crisis topics of the next millennium.

Whenever any new facility is proposed, consideration is given to designing the structure to use energy-efficient technology applications. More than 10 years ago, the department's Division of State Parks installed the first solar-assisted water heater at Bennett Spring State Park, and it still is operating today. In recent years, a greater emphasis has been placed on our use of solar energy. The new design for vault toilets will include a plan to use solar energy to run exhaust fans in remote areas where electricity is not readily available. The state park system is looking into the feasibility of using solar energy features in the new modern rest room at Wallace State Park.

Other energy applications have been used as well, and several attic-source heat pumps have been installed to help heat water in rest rooms in

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New fridge cools costs

If you still use a refrigerator from the 1970s or early 1980s, you could be paying up to 50 percent more for electricity than necessary. The following tips can help consumers purchase new models with efficiency features that can lower a refrigerator's electricity consumption by half (on average, equal to one eighth of your monthly electricity use).

- Buy a model that has the freezer on top. A side-by-side refrigerator/freezer can cost as much as 25 percent more to operate than a comparable top-mount.
- Optional features such as a through-the-door water and ice dispenser use more energy and can add hundreds of dollars to the purchase price.
- Models with automatic defrosters pull almost twice as much energy compared to models with manual defrost.
- Be sure to comparison shop. Prices often widely vary from store to store on the same unit.
- Search for a refrigerator with automatic moisture control. These have been designed to prevent moisture accumulation on the cabinet exterior without the addition of a heater. Refrigerators with "anti-sweat" heaters consume five to 10 percent more electricity.
- Make sure the door seals are airtight. Check this by closing the door over a dollar bill so it is half in and half out of the refrigerator. If you can easily pull the bill out, the latch needs adjustment or the seal is too loose.

Source: Wisconsin Energy Bureau

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LETTERS

I have been receiving *Missouri Resources* and thoroughly enjoy reading it. I noticed in your summer 1999 Vol. 16, No. 2 that you have a publication online (Status of Missouri's Waste Reduction Goal) and I wondered if you also have *Missouri Resources* online? Have you considered sending it by e-mail, thus reducing the expense of printing, the postal expense and also, and very importantly, the cause of cutting valuable trees? Your articles are so good and I wish more people had access to them. Pictures are great, too.



I am going to pass the "Re-Source Your Trash" (page 23) article to the Bible School teachers of the church where I am a member, the First United Methodist Church in Bourbon, Mo., to use this summer. Maybe they can teach the kids to "re-frain" from throwing their trash away or "re-create" something useful or decorative (I didn't see those two words used). Thanks for your attention to this e-mail.

Janet V. Sappington
Bourbon

I didn't see a Web site listed in *Missouri Resources*. Am I at the right address for Katy Trail info? Some friends of mine just did the entire trail with some camping, beds and breakfasts, towns, points-of-interest, etc., information they claim they received from you. My friends and I are planning the same trip and would certainly appreciate the same info. I was fortunate to do both "balloon" trips DNR sponsored a couple of years ago and they were quite enjoyable.

J. David Gattermeir
Lee's Summit

Editor's note:

Information about all of Missouri's 80 state parks and historic sites can be reached at [<http://www.mostateparks.com>], part of DNR's main web site. Once you are on that page, the Katy Trail is in the list of parks and sites. Missouri Resources can be accessed through DNR's Web address at [www.dnr.state.mo.us].

I am writing to compliment you on your fine publication. I find it to be enjoyable reading, as well as informative about the goings-on in Missouri.

I am fairly new to Missouri and find it to be a fascinating part of the country. I have read friends' copies of *Missouri Resources*, and now would like to be added to your mailing list.

Thank you for your consideration in this matter, and I'm looking forward to reading more about Missouri in upcoming issues of *Missouri Resources*.

Andrew M. Palmquist
Piedmont

I am a freelance writer who has written some articles about the Honey War. I enjoyed the way it was woven into the border disputes article in the summer issue.

However, I do have a couple of corrections. The poem was published in the October 26, 1839 *Palmyra Whig and Advertiser* - not December 26. The battle was over by then. Also, in my research I found several different copies of the poem. I am sending a copy of the original poem in its entirety as it appeared in the newspaper. You may notice that there is no byline. Every source that I discovered, though, does attribute it to John Campbell.

Thanks for a well done magazine.

Diana West
Joplin

Letters intended for publication should be addressed to "Letters," Missouri Resources, P.O. Box 176, Jefferson City, MO 65102-0176 or faxed to (573) 751-7749, attention: "Letters." Please include your name, address and daytime phone number. Space may require us to edit your letter. You also can e-mail Missouri Resources staff at moresdnr@mail.dnr.state.mo.us

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NEWS BRIEFS

Employees win governor's award

Missouri Department of Natural Resources (DNR) employees were members of three teams that received the 1999 Governor's Award for Quality and Productivity. The award is given to teams that find better uses of state resources.

DNR employees Carl Brown, Beverly Buschmann, Brad Carter, Deana Cash, Robert Eck, Gary Gaines, Jacquelyn Hicks, Marty Kasper, Karen Nosovitch, Jim Penfold, Betty Prouhet and Byron Shaw were honored for service on DNR's Environmental Management Institute Team. The team helps small communities develop and improve their capacity to manage environmental infrastructure.

In addition, department employees Ron Burgess, Steve Decker, Clinton Finn, Keith Forck, Doug Garrett, Jim Huck, Steve Jones, Jim Macy, Tom Siegel, Breck Summerford and Steve Townley were recognized for their work on the Missouri Water and Wastewater Review Committee. The committee, composed of DNR staff and the departments of Economic Development and Agriculture, reduced the time required for reviewing financial assistance applications for public water and wastewater projects.

Also honored were DNR employees Sharon Biggs, Joe Bowdish, Brad Harris, James Long and Kenneth Teeter. They were recognized for their work on the Missouri Interagency Clandestine Drug Lab Task Force. The task force has ensured the safe handling of hazardous materials found in clandestine laboratories. Additionally, the task force reduced the federal cost of drug waste disposal from \$2,537 per site to \$53 per site.

Missouri mourns Roger Pryor

Missouri lost a celebrated champion of the environment when R. Roger Pryor died of a heart-related illness in St. Louis on March 23, 1999.

Pryor is best known for his 14-year career with the 5,000-member Missouri Coalition for the Environment. Since 1992, he served as the coalition's executive director and senior policy director.

State Rep. Joan Bray of St. Louis honored him with a resolution in the Missouri House of Representatives saying Pryor opposed "nonsensical development in floodplains, the clear-cutting of publicly owned forests and drilling for lead in the Mark Twain National Forest system." In addition, Pryor organized the state's first natural areas conference and spent six years compiling the definitive survey of Missouri's natural areas.

A longtime supporter of the state parks system, Pryor also spent three years working as a planner for the Department of Natural Resources.

Friends remember him as a Renaissance man who was an author, guitar player, folk singer, and dedicated father and husband.

UMR victorious at solar race

The University of Missouri-Rolla won first place in Sunrayce 99, the nation's largest solar car race. The team won the event after taking the lead on the second day and beating back a challenge from Queens University in Ontario, Canada.

The University of Missouri-Columbia finished sixth out of 29 teams. The event was held June 20 to 29 with the race starting in Washington, D.C. and ending in Orlando, Fla. For several years, DNR's Division of Energy has helped fund both university programs.

The overall race time for UMR's car, the Solar Miner II, was 56 hours, 16 minutes and 44 seconds, nearly an hour in front of the second place car and almost 10 hours ahead of MU's SunTiger IV.

UtiliCorp offers green power

Beginning this month, UtiliCorp plans to offer "green power" to a limited number of customers in the Kansas City area. Green power is electricity that is generated through renewable energy technology. Renewable energy comes from non-depletable sources such as solar, wind or biomass, which generate fewer emissions than fossil fuels.

The power will come from two wind turbines at the Jeffrey Energy Center northeast of Topeka, Kan.

DNR's Division of Energy helped UtiliCorp and Missouri's Public Service Commission finalize plans for the program.

Customers will pay an additional \$5 monthly for 100 kilowatt hours of green power, which equals between one-sixth and one-seventh of an average residential electric bill. UtiliCorp plans to launch the program by sending details in energy bills and announcing a drawing for approximately 320 beginning participants.

Katy Trail adds new section

The new 35-mile section of Katy Trail State Park from Sedalia to Clinton is open for hikers and bicyclists. Twenty-five miles of the section is open for equestrian use as a pilot project to determine its feasibility as a multi-use trail.

Trail heads are located at the Missouri State Fairgrounds in Sedalia, and at Green Ridge, Windsor, Calhoun and Clinton. With the opening, Katy Trail State Park now runs approximately 220 miles - from St. Charles to Clinton - and is the longest developed rails-to-trail project in the nation. Work is continuing on development of the trail through Sedalia.

Users praise parks

In another overwhelming show of support, almost 99 percent of users of Missouri state parks and historic sites said they were satisfied with their 1998 visits.

The results are part of a survey conducted by the University of Missouri at eight state parks and historic sites in the summer of 1998. According to the survey, 87.1 percent of the users said they were very satisfied with their visits with 11.8 percent saying they were somewhat satisfied. This mark is even higher than the 90 percent satisfaction rating from a 1995 study.

"This increasing satisfaction rating is outstanding and shows that our department is continuing to do an excellent job of serving the users of our state parks and historic sites," said DNR Director Stephen Mahfood.

A similar study is being conducted in nine state parks this summer and is part of an ongoing effort to provide visitors with opportunities to comment on their parks visits.

Parks program changes location

The department's Historic Preservation Program has moved its offices to 100 E. High St. in Jefferson City. The offices were moved in August to the historic building at the corner of High and Jefferson streets. All phone numbers will remain the same. The main number is still (573) 751-7858.

Litter company receives grant

Canbrands of Springfield received \$27,900 from DNR's Environmental Improvement and Energy Resources Authority's (EIERA) Market Development Program to purchase equipment for their production facility. The company manufactures cat litter from recycled newsprint and sawdust. The Springfield plant is the only facility operated in the United States by Canada's Canbrands International Ltd.

Bugged by 2000?

Is Missouri ready for the new millennium? DNR's Division of Environmental Quality is working with the U.S. Environmental Protection Agency (EPA) to educate wastewater and drinking water facility owners or operators about the potential Year 2000 (Y2K) problems through fact sheets and articles detailing progress.

DNR's Public Drinking Water Program does not expect any significant loss of service. The state's large water and wastewater systems have extensive computer-assisted controls and have already evaluated and addressed their Y2K compliance issues. The systems should all be Y2K-ready, but they will have staff ready in the early morning hours of Jan. 1, 2000 - just in case any unforeseen computer problems should arise.

Many water suppliers and wastewater facilities already have completed a six-step approach to Y2K recommended by EPA and do not expect problems.

A complete version of EPA's "Year 2000 Water Fact Sheet" can be found at:[[www.epa.gov/year 2000/ow.htm](http://www.epa.gov/year2000/ow.htm)]. Additional background on state agency efforts are available on the Missouri Office of Information Technology's Y2K web page: [www.y2k.state.mo.us/]. For more information, contact Kent Peetz of DNR's Water Pollution Control Program at (573) 751-1300 or Darrell Osterhoudt of DNR's Public Drinking Water Program at (573) 751-5331.

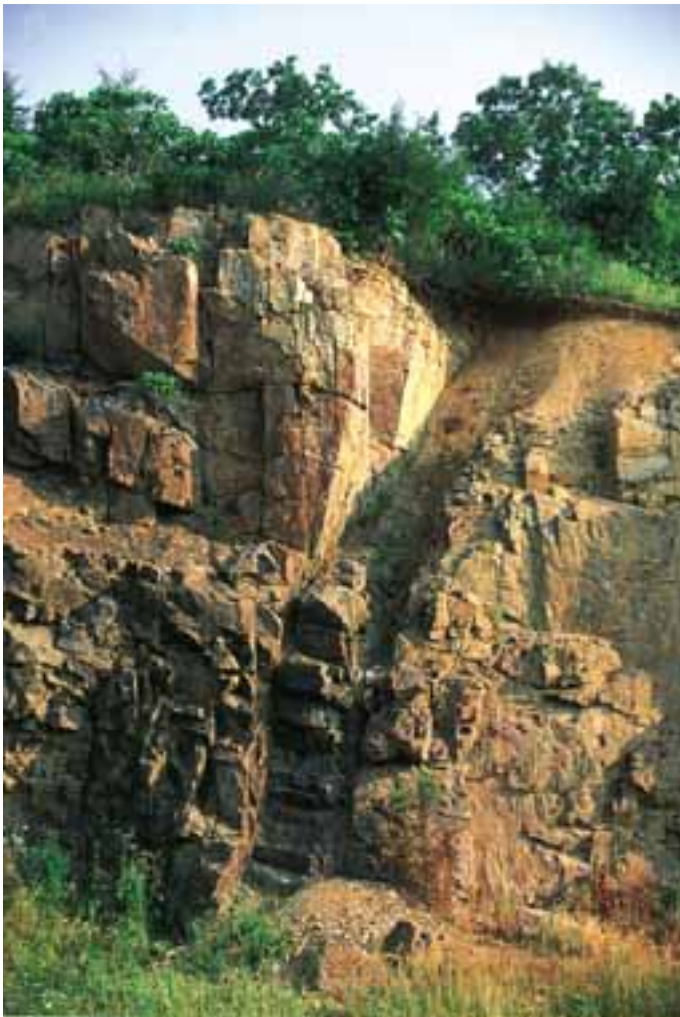
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ONE LAST WORD

St. Francois Mountains: Aging Gracefully

by Dwight Weaver
photograph by Nick Decker



In Missouri's Ozarks, the St. Francois Mountains were created largely as a result of volcanic upheavals that occurred more than a billion years ago.

Let a person pass the age of 100 and people come calling to discover the secret of their longevity. The answers given are never altogether satisfactory. The secret, one concludes, must be hidden in the person's DNA. That is how it is, with mountains at least, for it is the "DNA of the mountains," or make-up of the rock of which they are formed, that has much to do with their longevity.

The St. Francois Mountains of southeast Missouri are among the oldest mountains on earth. We should be proud to have such geologic antiquities in Missouri.

The bedrock of the eroded knobs of the St. Francois Mountains is at least 1.5 to 1.3 billion years old. As with human longevity, it is a complexity not easily explained in a few paragraphs. All mountain ranges are the result of the succession of interplay of fundamental earth forces.

The buried igneous bedrock of the whole Ozarks region is similar to the hard, exposed, igneous rock of the St. Francois Mountains. But only in the counties of St. Francois, Madison, Iron, Carter, Washington, Shannon, Reynolds and Wayne is this ancient rock exposed at the surface. These mountains sit like islands in the vast expanse of younger, softer sedimentary limestone, sandstone and dolomite rocks that lie spread out in all directions from their flanks.

Around 1.4 billion years ago, the foundation of the Ozarks was formed by the eruptions of hundreds of separate volcanoes. Steam, smoke, ash, cinders and lava flows buried the landscape. Intrusions of unseen molten material also swelled beneath the crust but did not reach the surface. This raised the foundation of the Ozarks in

southeast Missouri above the rest of the region as well as above the surface of the ancient ocean that covered the land at that time. In so doing, the St. Francois Mountains were born. From ocean floor to peaks, the mountains could have been 10,000 feet high, half of which was above the ocean's surface. It was a cataclysmic period that lasted more than half a billion years.

Afterwards, the lingering ocean deposited thousands of feet of sedimentary rock atop the old volcanic rock that formed the bed of the ocean. The St. Francois Mountains were probably buried by several thousand feet of sediments. Hundreds of millions of years of geologic uplift followed, raising these deposits and driving away the ocean waters, creating new land surfaces. Surface erosion by streams and subsurface solution of the sedimentary rock by groundwater then carved a hilly topography in the softer sedimentary deposits, giving us our beautiful Ozark landscape.

How do the Ozark Mountains and the St. Francois Mountains relate? The rugged, hilly Ozark Mountains were largely produced by surface erosion and dissolution of the bedrock by acidic groundwater over the past 65 million years. By contrast, the rugged St. Francois Mountains were largely produced by volcanic processes that occurred more than one billion years ago.

To understand the specific geologic events that have given us the St. Francois Mountains, pay them a visit. Explore Johnson's Shut-Ins State Park, Sam A. Baker State Park, Elephant Rocks State Park, St. Francois State Park and Taum Sauk Mountain State Park. Visit with the park staff. Ask them about the origins of the colorful ash-flow tuff, rhyolite, rhyolite porphyry, granite and basalt. With diligence, and some study and field observations, you'll soon decipher the "DNA" of Missouri's oldest mountains and discover why they are aging so gracefully.

H. Dwight Weaver is the division information officer for DNR's Geological Survey and Resource Assessment Division.

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Power from Above Future is Brighter for Solar Cells

*by Jim Muench
photographs by Nick Decker*



Experts predict solar panels, similar to this one in the backyard of a Blue Springs residence, will become a more common scene in Missouri neighborhoods.

using the solar system; I'm real happy with it."

Cessac's solar system allows him to move his solar panel and pump to any of his three ponds, and it allows him to pump water uphill to his 50-acre pasture, which is divided into ten 5-acre plots which affords rotational grazing. He said he can pump between 300 and 1,300 gallons per day, at a rate of 2 gallons a minute, depending on the cloud cover.

Increasingly, people like Cessac are turning to solar power when conventional electric power is not the best fit. In many remote applications, electricity produced by solar cells is now price-competitive with traditional electric power. The cost of photovoltaic power panels has decreased from about \$100 per watt in the early 1970s to less than \$5 per watt today, according to James E. Rannels, acting director of the federal Office of

Bob Cessac needed to water his thirsty cattle. And he had to cart it uphill from a pond that was half-a-mile from the nearest power pole.

Cessac, who farms 330 acres near Fayette found his answer in solar power. In a 1996 demonstration project funded by the Missouri Department of Agriculture, he developed a solar power system to pump water for his cattle and compared it to both a traditional electric water pumping system and a watering system that relied on gravity. Cessac's system uses a portable solar panel.

"Gravity feed is most economical if you just have one pond and if terrain allows you to do it, but the pond has to be uphill from the pipe," Cessac said. "I'm still

Photovoltaic and Wind Technologies.

Photovoltaic cells, commonly called solar cells and usually made from highly purified silicon, convert sunlight directly into electric power without the use of moving parts and without producing fuel wastes or air pollution. Solar panels now sit atop a million buildings and heat the water in 300,000 swimming pools in the United States. The Solar Energy Industries Association estimates these numbers should rise about tenfold in the next decade.

The marketplace is changing quickly, and the U.S. solar industry leads the way into new markets, both domestic and overseas. For instance, U.S. manufacturers export more than two-thirds of their photovoltaic products to developing countries that need to provide electricity to remote villages without a traditional electric infrastructure in place.

Interest in solar power is rising in Missouri as well. The University of Missouri-Rolla's victory in the national Sunrayce for solar cars, along with a strong sixth-place finish by the University of Missouri-Columbia, raised the visibility of solar power recently. Likewise, the state's solar industry received a boost in April 1999 when Soltech 99, the national conference of the Solar Energy Industries Association, came to Kansas City. The Department of Natural Resources' Division of Energy co-sponsored the conference and provided funding for the cars.

Distributors in Missouri report that interest in solar power picked up in the past year. "Last year, I got maybe a hundred calls; this year it's more like 400 calls," said Pat Pavlovic of Suncraft in St. Louis, a company that specializes in solar and wind electricity for homes. "People are getting interested in solar this year because of Y2K (the Year 2000 computer compliance issue that some believe will disrupt electric services). They are interested in solar either for backup power in an emergency, environmental reasons or self-sufficiency."

According to Bill Roush, president of the Heartland Solar Energy Industries Association and of Solar Electric Systems Inc. of Kansas City, the industry has been growing about 20 percent a year in the last three years. "People are getting used to using solar power," he said. "More and more people now have seen solar work, either in boating or in an RV (recreational vehicle), where they're recharging batteries, and they say, 'Well, maybe I can use solar in another application.'"

In Kansas City, he said, customers mainly use solar as a backup power source. "For cabins or small getaways, solar is the primary option," he said. "Also, the solar systems can solve power quality problems. It acts as a big, uninterrupted power supply for heating or lighting."

In tandem with photovoltaic systems, passive solar design techniques can help use the sun to great advantage in buildings. Building projects often start with designs that use passive solar techniques such as proper window placement and orientation of the building on the construction site. Good use of natural sunlight, windows and well-placed shading collect and use the sun's energy to its greatest heating and cooling potential.

Passive solar design is best incorporated early in the design stage of a building, but the techniques can be applied when renovating older buildings, too. Designers must factor in the amount of sunlight and heat allowed inside and retained by stone or brick materials in the building.

"Renovation is a passive design issue because older buildings often used stone and many windows, and concrete floors and walls," said John Hoag of Hoag Associates Architecture & Planning in St. Louis. "It's often a question of utilizing those materials as best you can."

Hoag said there are plenty of architects interested in solar energy. "The client base is the constraint," he said. "The design talent is there. There are enough (professionals) who are sufficiently skilled or educated."

Increasingly, architects see exciting potential to integrate photovoltaics in buildings. Building designers would place solar cells around windows, attach them to roofs, affix them as roof shingles, laminate them on metal roofs or integrate them into specially designed walls.

Two fundamental recent developments in the United States are profoundly influencing the market for building-integrated solar power, said Steven Strong, president of Solar Design Associates in Harvard, Mass. First, architects have begun to perceive photovoltaics as a design element and not simply as a utilitarian mechanism. He said photovoltaics are gaining the status of a high-quality, prestigious building material such as ornamental granite. What once was considered unattractive is becoming an attractive status symbol.



In a remote location without electricity, the roof of this Ha Ha Tonka State Park restroom shows the photovoltaics used to run exhaust fans. The roof-mounted solar panels are much more affordable than the cost of connecting an electrical line.

"Ten years ago, architects would incorporate solar panels, but they would pay for an additional screen to shield them from view," Strong said. "Now manufacturers have come to realize that photovoltaics must be integrated into the design elements and incorporated as highly visible and public statements of their "green" (environmental) credentials."

Strong said the second profound development is that manufacturers are starting to make photovoltaics integral components of standard building products. For instance, they are developing a new generation of products such as overhead window glazing for skylights or atriums that incorporate photovoltaics. "Instead of letting the light through and reflecting the heat away, as it has been historically, it will be used to generate electricity," he said.

At present, solar power is used most in specialty markets where electricity is needed, but where traditional utility lines are too costly to extend. The fastest growing applications of photovoltaic power systems lie in such areas as water pumping; lighting and traffic signals; refrigeration of medicines and food; emergency services; and telephone, television and satellite communications.

When connecting an electric line to a remote location is too costly, photovoltaics can be an attractive alternative, especially when the environmental benefits are factored in. These factors have led some states,

including Missouri, to use photovoltaics to power signs at remote construction sites, to run navigational aids along waterways, and to operate emergency phones along rural interstates. In Missouri, the Department of Natural Resources plans to use photovoltaics at remote locations in some state parks to run exhaust fans in restrooms and is looking at other options as well. DNR's Division of Energy has received a special \$21,000 grant from the U.S. Department of Energy to fund solar power projects in remote locations.

The Springfield school district, recently installed four solar-powered lights for its nearby school-zone warning signs at McBride Elementary School. The cost of running wires to the meters was prohibitive, said Dave Abbott, assistant coordinator of maintenance for the Springfield Public Schools.

"By not going with the standard electrical power lines, we saved \$30,000 up front because of trenching, backfill, electrical conduit and wiring," Abbott said. "In addition, we estimate \$530 per year in operating cost savings."



Storage batteries in Tim Harrington's garage are charged by generating electricity from the sun and wind. The cells provide five days of backup power.

compared to the Consumer Price Index of goods, which increased 149 percent during that time. The efficiency of the solar cell also has increased 42 percent over previous panels, according to Ken Turner, president of Parker-McCrory. The system's six-volt battery holds its charge for 24 or 25 days, even if the sun doesn't shine.

Another important use for photovoltaics lies in protecting pipelines, underground storage tanks and suspension bridges from metal corrosion. Solar cells provide a small electric current that combats the natural process of corrosion.

The ability to provide remote power also makes photovoltaics a good choice on farms. Parker-McCrory Manufacturing Company, headquartered in Kansas City, uses solar panels in its Parmak line of electric fences. The solar cell recharges a battery that provides power to the fence. In traditional systems, farmers have to constantly swap batteries to keep the system running.

When Parmak pioneered the system in 1978, the solar unit cost \$160. Twenty years later, it costs \$180, an increase of just 12.5 percent,

"If we have 24 or 25 days of complete darkness, your solar fencing system will be the least of your worries," Turner said.

As farmer Bob Cessac found, another Missouri farm application is pumping water for livestock, which offers the environmental benefit of fewer herds tearing up and depositing wastes in stream banks to get a drink.

DNR's Soil and Water Conservation Program supports the use of such solar-powered agricultural products. The Soil and Water Conservation Districts Commission provides funding, through the state's cost-share program, for

solar panels and solar-power fence chargers when used in a planned-grazing-system practice. The cost-share program is administered locally by soil and water districts.

In conjunction with the local soil and water conservation districts, the Missouri Department of Conservation (MDC) has promoted a system in recent years that works well with rotational grazing, a type of grazing in which a large field is sectioned into smaller paddocks. A watering tank can be moved to whichever paddock is being used.

"When it is not cost-effective to run an electric line, then solar can get the job done," said Bill Turner, streams technical leader for MDC. "The systems function well as long as the right system is selected for the operator's needs."

For a copy of the MDC's handbook, Watering Livestock with Solar Water Pumping Systems, contact Bill Turner c/o MDC at 1014 Thompson, Sedalia, MO, 65301.

Where might solar power have the most impact in the near future? Probably in telecommunications, as cellular phone towers begin to use solar cells to power their microwave repeaters. "The solar industry is going to ride on the back of cellular phones," said Scott Sklar, executive director of the Solar Energy Industries Association. "As the wireless communication industry goes, so will we."

Jim Muench is division information officer for the Missouri Department of Natural Resources' Division of Energy.

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RESOURCE HONOR ROLL

For almost a year, the Sedalia Fire Department's Hazardous Materials Team has successfully operated Missouri's first Clandestine Drug Lab Collection Station. In a nine-month period, Sedalia-area law enforcement officials delivered more than 1,300 pounds of drug paraphernalia from 31 methamphetamine labs to the station. The collection station concept offers police a disposal alternative that is efficient and cost effective. Materials from the 31 meth labs were recycled, neutralized, routed to solid waste facilities or packaged as hazardous waste. In the past, similar cleanups could cost up to \$5,000. This time only \$975 was spent for off-site storage of the highly flammable liquids.

The team's Battalion Chief Greg Harrell conceived and developed the idea for the station with help from Assistant Fire Chief Don Meier. Other team members from the Sedalia Fire Department include Paul Withers, Robert Harvey, Steve Daleske, David McMillin, Brad Vansteenburgh, Matt Irwin, John Stratton and Roy Haskett. Pettis County Fire Department team members were technicians Mike Layton, Blake Calvin, Jeff Williams, Marcia Chapman and Kurt Kruger.



Sedalia Fire Department
Hazardous Materials Team

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RESOURCES TO EXPLORE

Cuivre River State Park

by Bruce Schuette



Built in the late 1800s, this bridge over the Cuivre River can be found in the southwest corner of Cuivre River State Park.

Photo by Bruce Schuette

Starting about 40 miles northwest of St. Louis and extending to Hannibal is a very rugged and hilly region known as the Lincoln Hills. This region is unique for northern Missouri, and in many ways more closely resembles the Ozarks of southern Missouri than the glaciated plains that surround it. Located at the southern end of the Lincoln Hills, just three miles east of Troy, is one of Missouri's largest and most rustic state parks – Cuivre River State Park.

With almost 6,395 acres, the park blends together many unique resources and demonstrates stark contrasts. A mix of natural habitats like upland woods, riparian forests, limestone glades, tallgrass prairie, savannas and bluffs allows the park to support a vast array of native plant and animal life. The combination of a modern campground, three group camps, a 55-acre lake, picnic areas, a visitor center and almost 40 miles of trails allows for diverse recreational uses. To help protect the park while serving an estimated 500,000 visitors each year, the park contains three designated state natural areas, two state park wild (wilderness) areas, a state outstanding resource waterway (Big Sugar Creek) and ecological management areas.

The park's diverse elements also show startling contrasts. For example, the natural resources of the park show the results of both fire and ice. Ice, in the form of a continental glacier, or ice sheet, covered virtually all of Missouri north

of Interstate 70 during the Pleistocene Ice Age. While the effects of this glaciation are less in the Lincoln Hills region than elsewhere in northern Missouri, many rocks called glacial erratics, which were carried here by the glacier from points north, can be found throughout the park. Many of these rocks, like small boulders of granite, stand out from the locally formed bedrock of limestone, chert and sandstone.

The opposite extreme from ice, namely fire, has profoundly influenced the natural plant communities. For thousands of years, fires started by Native Americans and by lightning would burn across the landscape, shaping the prairies, savannas, glades and even the woodlands. The accounts of early settlers paint vivid pictures of these native grasslands and oak woodlands.

Another contrast is that the wild character of a park is located within the official St. Louis metropolitan region, less than 50 miles from the Gateway Arch. Despite all the development and its high visitation rate, Cuivre River contains the second largest natural area in the state park system: the 1,872-acre Lincoln Hills Natural Area. Cuivre River is one of two Missouri state parks to include two separate wild areas - the Northwoods and Big Sugar Creek. Among all of Missouri's state parks, Cuivre River ranks third in the number of state-listed rare and endangered species protected within its boundaries.



A collection of rollstands at Bollinger Mill represent the evolution of the roller milling process from the mid-1800s to the turn of the century. Only a few historic mills remain that interpret this important milling process for the general public. *Photo by Nick Decker*

Protecting the diverse array of natural resources has required combining resource stewardship activities. Several of the park's natural communities, and many species, are dependent on fire. Prescribed burns have been used since 1976 to restore and maintain these unique and important resources. In a few areas, woody plants have invaded native grasslands so severely that some careful and selective thinning has been necessary. Seeds of native plants have been collected and used to restore these species in other more disturbed sites. Several highly invasive exotic plant species, unfortunately, grow in parts of the park. These alien species severely threaten the native plants and efforts to control them have begun.

leaders who wanted to bring a conservation project and jobs to the area during the Depression. With state funds severely limited, they met with a representative of the U.S. Department of the Interior. The Interior Department's National Park Service sought to bring parks and outdoor recreation closer to metropolitan areas while providing jobs for unemployed young men. This new program was called the Civilian Conservation Corps (CCC). After watching the sun set from the top of Frenchman's Bluff, it was decided that this would make a good project.

Cuivre River State Park began as a vision of a small group of local businessmen and civic

Land acquisition began in 1934 and immediately a company of CCC enrollees was transferred here. The first company (Co. 787) moved here from Kansas in November and began building their camp. In mid-1935, Co. 3771 was formed here, and Co. 787 was moved to another location.

For the next seven years, members of CCC Co. 3771 built many structures and facilities that still are in use. They removed fences, built roads - including rock gutters and small bridges that are still in use - constructed a rock picnic shelter and several group camps as well as other projects. Many of these structures are protected in the National Register of Historic Places.

The era of the Civilian Conservation Corps came to a close in 1942. In 1946, Cuivre River was transferred from the federal government to the state, and became one of Missouri's state parks. Today, the park, named for the nearby Cuivre River, is one of 80 state parks and historic sites administered by the Missouri Department of Natural Resources.

Since its establishment, the park's beauty has been enjoyed by millions of visitors. One hundred campsites, half with electric hook-ups, provide accommodations for almost 30,000 campers a year. There are special camping areas for backpackers, equestrians and scouts. Three group camps, primarily designed for large organized youth groups, receive heavy use by school, scout, church and civic youth camps. These camps, Camp Cuivre, Camp Derricotte and especially Camp Sherwood Forest, are important legacies of the Civilian Conservation Corps. Lake Lincoln, a 55-acre reservoir built in 1965, offers fishing, swimming and non-motorized boating. Three picnic areas, one including a historic CCC rock picnic shelter, provide grills and tables for relaxing outdoor meals. An extensive trail system, consisting of 18 miles of trails open to equestrian use and 20 miles of hiking-only trails, traverses Cuivre River State Park.



Park historians know that construction began on the Burfordville Covered Bridge in 1858. However, it is unclear whether the bridge was actually finished before or after the Civil War. Currently, the bridge is in its best structural condition in decades, thanks to a 1998 renovation project. *Photo by Nick Decker.*

Nineteen ninety-nine marks the 20th anniversary of the park's annual nature photography contest. The contest is held each September and includes a display in the visitor center of all the entries. Any amateur photographer can submit photos of wild Missouri plant and animal life and scenes from Missouri's state parks.

Many other special events and programs are held throughout the year. The annual "Quivering Quads" long-distance trail run has become the largest special event held in the park. In 1998, more than 330 runners from 17 states participated, running distances from 10 kilometers to 50 miles on two of the park's longer trails.

For decades, Cuivre River State Park has blended together recreational facilities and important natural resources, trying to provide the best of both. With the help and support of the park's many visitors, this will continue.

For information on Cuivre River State Park, call the park at (636) 528-7247 or the Department of Natural Resources toll free at 1-800-334-6946 (voice) or 1-800-379-2419 (TDD).

Bruce Schuette is the park naturalist at Cuivre River State Park, within the department's Division of State Parks.

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TEACHER'S NOTEBOOK

Teaching Environmental Topics Encourages Independent Thinking

by Steve Schneider

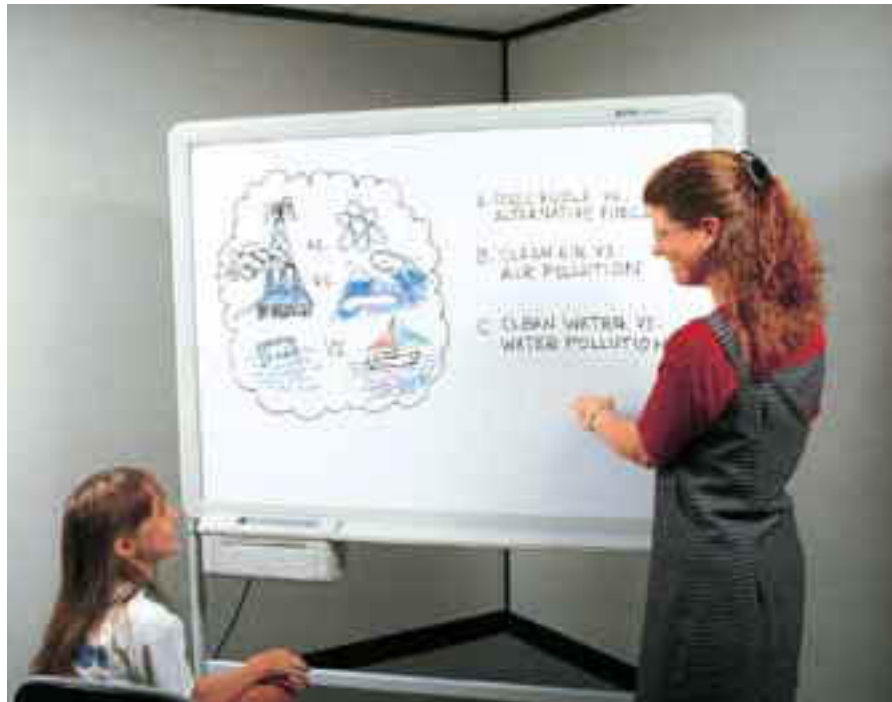
"All progress has resulted from people who took unpopular positions."
- Adlai Stevenson

The mission of environmental education is to promote responsible citizen actions. Such actions depend upon knowledge of the natural and built environments, understanding the issues and making informed decisions on those issues. Only when these citizens have the needed skills to make informed decisions will solutions be found for many environmental issues.

Environmental educators want to encourage the development of independent thinkers able to make informed decisions on environmental issues.

Environmental education involves a multidisciplinary process that focuses on critical analysis of environmental issues. Facilitating higher-order thinking skills (critical thinking, problem solving and decision making) provides students with the tools; and the environment provides real issues for honing the skills.

Environmental issues often are controversial. Typically, there are differing positions regarding the solution to an environmental problem. This results from people having different life experiences, perspectives, beliefs and values. Environmental issues are controversial because they are often too complex to have single "right" and "wrong" solutions. This often is true of other controversial issues as well.



Teachers can sharpen students' critical-thinking skills by presenting various points of view during classroom discussions of environmental issues. *Photo by Nick Decker*

Popular positions are not always informed positions. Students need practice to develop competence in dealing with environmental issues. Yet, many teachers do not discuss environmental issues in the classroom to avoid controversy. Investigating environmental issues provides opportunities for students to develop critical-thinking, problem-solving and decision-making skills. These skills are listed as performance or process standards in the state's Show-Me Standards for education.

Guiding Student Thinking Through Questioning

Students need guidance to become aware of their own biases, to be objective and logical, and to understand other points of view. Questioning is one way to provide guidance. The way questions are asked can have an enormous effect on how well students learn.

Use questions to help clarify students' positions and focus and define their thinking.

Remind the student that their position is open to cross-examination and refutation!

- Is this position something you chose or are you advocating someone else's position?
- Is your position based on evidence, beliefs or personal opinion, or a combination thereof?
- Who published or presented the information you are offering as a source?
- Who conducted the study or research? Are they credible?
- Who funded the study or research? Are they promoting a "hidden agenda?"
- Are all sides of the issue addressed fairly and equally?
- Is there, or does there appear to be, conflicting information?
- Did you consider an alternative position(s) to your own?
- What are some possible consequences of your position?
- Will you reassess your idea in light of new information?

Guidelines

Facilitating competencies in higher-order thinking skills requires teaching controversial issues. You do not need to be an expert on the issue. However, the discomfort level of teaching controversial issues can be eased by following these guidelines:

- Guide the discussion, yet remain neutral. Or, play the role of devil's advocate. Offering different points of view encourages students to defend their reasoning or position.
- Focus on the process of clarifying the students' viewpoints.
- Minimize polarization of viewpoints; maximize ideas.

- Encourage all students to participate. One or two students should not dominate.
- Consider all positions on an issue. Acknowledge the merits of every idea. Present the diversity of perspectives in a balanced way.
- Understand that others have reasons for their choices. Urge students to consider the underlying beliefs and values of each choice. Realize one's own knowledge is not complete until one understands why others feel the way they do about the choices.
- Do not allow personal attacks. Focus on ideas, not people. However, choices and positions are open to cross-examination and refutation.
- Permit rational and disciplined arguments. Many people, however, are uncomfortable with disagreement. To help resolve differences, reverse students' roles in arguments to make a good case for the opposing position.
- Identify the range of realistic alternatives. Have students support their positions by using valid information, reason, inferences, conclusions, causation and correlation, and by understanding bias.
- Use methods to evaluate positions such as risk analysis, cost/benefit analysis, environmental-impact analysis, analysis of cumulative effects and economic and social-impact analysis.
- Move toward final resolution of an issue. Agreement normally is something that is less than unanimous. Informed consent is when parties do not really agree, but do not actively disagree. If a consensus cannot be reached, step back and analyze the situation. Reflection may raise new facts and issues not previously discussed and prevent rash decisions.
- Select methods of responsible action. Students should examine the consequences of their choices, actions and behaviors on the environment. Actions are not to be a required assignment! The goal is education, not advocacy.
- Strengthen students' perception of their ability to influence the outcome of a situation (self-efficacy).

Following these guidelines will provide the skills and approaches needed to critically analyze these and other controversial topics in a classroom setting.

Steve Schneider is an environmental education and information specialist with the Missouri Department of Natural Resources' Environmental Assistance Office within the Division of Environmental Quality.

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Status Report: The Quest for Less

by Ken Brogdon

photographs by Nick Decker



Ramona Huckstep empties food waste into a composting bin located behind the department's offices in eastern Jefferson City. In one year, employees kept more than one ton of such waste out of landfills.

If you really believe that individual environmental actions do not count for much, consider this proverb: "If you think you are too small to make a difference, try sleeping in a closed room with a mosquito."

This ancient observation helps illustrate a fundamental concept that has the Department of Natural Resources (DNR) and Bridging the Gap, Inc. (BTG) literally buzzing about their evolving partnership. This story is a progress report that brings readers up-to-date since Missouri Resources announced the partnership in spring 1998. The proverb also underscores an important core belief shared by both groups: even the smallest environmental choice can have a large impact when it is passed along to others at home, school or work. The Kansas City-based BTG is one of the state's largest non-profit environmental organizations.

"Through this proactive partnership, we have an opportunity to provide citizens, businesses and municipalities with simple ways to help the environment," said DNR Director Steve Mahfood. "It is free and easy for any group to participate."

On Earth Day 1998 in Jefferson City, Gov. Mel Carnahan announced that he would join with DNR and offer "Choose Environmental Excellence" to citizens, businesses and local

governments. "Choose Environmental Excellence" is the name of the statewide environmental education program that is patterned after a similar campaign in Kansas City. An editorial in The Kansas City Star shortly after the governor's announcement noted: "Business leaders, government officials, teachers and other citizens are going to get access to a tremendous reservoir of knowledge accumulated by Bridging the Gap. People who want to cut pollution and protect the environment will have a model of how to participate in those activities in their communities."

The original Kansas City campaign now includes 830 businesses, 30 local governments, 1,400 educators and more than 25,000 individuals. The department, through its Environmental Improvement and Energy Resources Authority (EIERA), has provided about \$120,000 for the initiative. The campaign's steering committee includes DNR, EIERA (a financial arm of the department), the Missouri Chamber of Commerce, Conservation Federation of Missouri and a BTG representative.

"The Department of Natural Resources has been a good partner with us and provided leadership, technical information and examples of some of the very actions that we believe others across the state may be interested in," said Bob Mann, director of Bridging the Gap. "A key ingredient is the understanding that private citizens, government, and business each bring a different perspective ... with which to address solutions."

A good starting point that highlights internal efforts is the DNR Pollution Prevention Work Group (P2). In 1995, the department, through its Environmental Assistance Office, established this work group to consider and identify opportunities for pollution prevention within the agency. Becky Shannon of DNR's Water Pollution Control Program served as P2 leader from 1995-99. For almost a decade, Shannon has been involved in many of the department's "Reduce, Reuse, Recycle" initiatives. The goals of P2 are to prevent pollution within the department, serve as a model for other state agencies and by setting an example - persuade others to follow.

"Reducing is the best way to help the environment. If you can't reduce using something, reuse it; if you can't reuse it, recycle it," said Shannon. "Our pollution prevention activities have focused on the department's role as a generator of pollution, and as a consumer and purchaser of goods and materials."

The work group features two employees from each of the five DNR divisions and EIERA. Each of these employees serve two-year terms. As the activities draw to a close each year, P2 remains viable by seeking new or renewed membership.

Recent P2 projects include an energy-efficiency upgrade of interior lighting in DNR's Geological Survey and Resource Assessment Division's (GSRAD) Rolla workshop and warehouse. P2 helped GSRAD employees evaluate existing and proposed lighting. Incandescent fixtures were replaced with energy-efficient fluorescent ones. GSRAD also uses low-mercury fluorescent bulbs as they become available. As a result, Shannon says GSRAD employees now have a brighter work area that uses less energy, saves money and prevents pollution without increased costs. In addition, a memo was sent from the department director alerting all procurement employees to purchase low-mercury fluorescent bulbs. For Shannon, the bottom line is that the use of the bulbs will reduce the amount of mercury that makes its way back to the environment.

In addition to low-mercury bulbs, Shannon suggests

replacing incandescent bulbs with compact fluorescent lighting. Compact fluorescents use one-quarter as much electricity to produce the same light as incandescent bulbs, and last 10 to 13 times longer. Over the life of one compact fluorescent bulb (about 10,000 hours), expect a savings of \$30 to \$50.

The environmental benefits also make compact fluorescents worth trying. An 18-watt compact fluorescent produces as much light as a traditional 75-watt incandescent bulb. Over its lifetime, a single compact fluorescent bulb will save about 570 kilowatt-hours of electricity, enough energy to avoid the emission of 600 pounds of carbon from a typical coal-fired power plant, according to Renew America, a non-profit environmental group.

P2 also looked at DNR's purchasing procedures as they relate to acquiring "green" products. Although there has been significant work done regarding the purchase of recycled items, the crucial concept of source reduction was sometimes neglected. Environmental issues to consider when purchasing green products (particularly in bulk) include toxicity, air pollution caused during storage and use, packaging, content disposal, and the impact of manufacturing and transportation. The product categories in question include a wide range of items from cleaning solutions and paint, to furniture and carpet tiles.

As a result of P2's efforts, a dialogue now is open between DNR and the state's Division of Purchasing. The department will help the purchasing division identify other environmentally sound products.

While employees were learning about the planned construction of a new DNR building in eastern Jefferson City, P2 helped planners consider cost-effective pollution-prevention options. Shannon said the work group took a common-sense approach to the task, trying to identify some of the more obvious pollution-prevention options. These include reducing the amount of volatile organic chemicals (VOCs), often found in the construction of office furniture. The toxicity of the vapors given off from the glue, fabric and other elements used in construction are worsened inside a controlled environment. Positioning the building to take advantage of the sun's light and energy also is part of the plan.



At one of its renovated Jefferson City facilities, DNR installed "green" building materials such as carpet made from recycled fibers, and high-efficiency lighting. These measures serve as a model for other agencies interested in reusing resources and maximizing energy savings.

Working with P2 and the state's Office of Administration, DNR's Division of Energy successfully integrated several environmentally friendly and energy-efficient features



DNR Employee Chris Cady shovels decaying food waste from a large, plastic container dubbed the "Earth Machine" into a fenced, homemade finishing bin. The material remains there for a few months before it is given away to be used as fertilizer for gardens, flower beds and around trees.

duplexed copies, composted food leftovers, established a used office supply collection area, reused building materials, recycled laser toner cartridges and used recycled office paper for notepads. Employees also are recycling aluminum cans, glass, motor oil, telephone directories and other publications, and corrugated cardboard. Department employees also collected more than 600 pounds of office paper during the first "Missouri Recycles Day," according to the state report.

Last year, DNR also adopted a policy to bolster its commitment to "green meetings." DNR Director Mahfood signed the department's first policy to conduct environmentally friendly meetings. Meetings and conferences sponsored by the department now provide attendees with washable coffee cups, plates, glasses, and utensils instead of disposable plastic kitchenware or typical foam coffee cups.

It may take a little extra effort to clean up afterwards, but consider how much paper and plastic can be kept out of landfills. For example, a conservative estimate of holding three meetings per week, consisting of 10 attendees, would use 30 disposable cups per week. Over the course of a year, as many as 1,600 cups would be removed from the waste stream.

"I believe the department is making progress and can help us reach out to even more citizens, but it is crucial that we get the word out on what is actually happening in terms of action," said Mann. "The other element the department can lend to this program is to share its success stories and provide this information to others. We need the department to step up and serve as an example for others."

If you still believe that individual actions do not count for much, remember the lone mosquito. You can make a difference.

For more information, contact Choose Environmental Excellence by calling 1-888-895-3605, or visit their Web

into its new Jefferson City facility. These included the use of VOC-free paint, solvent-free glues, carpet with recycled content, a ground-source heat pump, high-efficiency heating and air conditioning, and a fresh-air ventilator. The division also replaced 700 light fixtures with 400 efficient fluorescent ones. The new lights are controlled by motion sensors and are estimated to save 50 percent in total energy costs.

Like the P2 group, many individual employees throughout the department effectively reduce waste, recycle and reuse everyday office materials. According to the state's fiscal year 1998 "Recycling and Waste Reduction Report," DNR employees

site at [www.environ-excellence.org]. You also may contact DNR Communications Director Nina Thompson at (573) 751-1010.

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The Road Back to Route 66

*by Diane Warhover
photographs by Nick Decker*

When the initial development at Route 66 State Park opened in September, it was another step in an effort to turn an environmental tragedy into a success story that can be enjoyed by many. But this success story would not have been possible without many partners working together. Partnerships in nature occur all the time, and this park is an example of partnership and cooperation.

The 409-acre Route 66 State Park is located in St. Louis County and just off Interstate 44, which makes it accessible to the people of the St. Louis area. Built on property that was the former community of Times Beach, the park's initial development includes a picnic area and trails for hiking, bicycling and equestrian use.

"We are very pleased that we can open this park for several reasons. The Missouri Department of Natural Resources (DNR) promised the people of the state many years ago that we would clean up the Times Beach site and restore it for public use. We have fulfilled our commitment, and the result is a state park that can serve millions of people with its location near the St. Louis area," said Steve Mahfood, DNR director.



Cruising in his 1950 Dodge Coronet, Wayne Houseman of Union crosses the Meramec River on part of Route 66's original path through St. Louis County.

In addition to providing an area for recreation, the park will help visitors step back in time to an era when Route 66 was known as the "Main Street of America." A portion of the original Route 66, including a historic bridge across the Meramec River, runs through the park. Standing on that bridge, it is not hard to imagine what it would have been like to be driving a Corvette convertible on your way to the West Coast after having stopped at Ted Drewes for a refreshing frozen custard.

Although this story has a happy ending, the events leading up to this day were not always positive. Times Beach was a sleepy river town of about 2,500 residents when everything changed forever in the

early 1980s. It was discovered that waste oil that had been sprayed on the streets to reduce dust was

contaminated with dioxin at levels that prompted health concerns. The federal government bought out the residents and the state of Missouri oversaw a massive cleanup effort. With oversight from the U.S. Environmental Protection Agency and DNR's Division of Environmental Quality, Agribusiness Technologies, Inc. began the cleanup. The effort was so successful that Agribusiness Technologies, Inc. won several awards, including a certificate of environmental achievement from the National Awards Council of Environmental Suitability and a 1998 national award from Keep America Beautiful, Inc.

Once the cleanup was completed and it was determined that the area was safe, the land was turned over to DNR's Division of State Parks. "We know how people remember Times Beach, but we are committed to changing that impression," said Douglas Eiken, director of DNR's Division of State Parks. "We are not forgetting the area's past, but we are looking to the future and what we can offer visitors who come here."

That future includes more development, and this is where partnerships become even more important. When all trails are developed, more than eight miles of trail will traverse the park, and offer opportunities for hiking, bicycling and equestrian use. Many of these trails follow the route of the former streets in Times Beach, and are good places to spot flocks of turkey, nesting geese, deer, and more than 40 species of birds.

The trails in Route 66 State Park will serve as an important link in an effort to connect many state, county and local parks and residential areas in the Meramec River Valley. This concept, known as the Meramec Greenway, will be a series of trails from the St. Louis metropolitan area to Meramec State Park in Sullivan. One partnership already has resulted in connecting trails in the city of Eureka to the trails in the new park.

"We are very excited that we can extend the recreational hiking paths into Route 66 State Park. We feel this extension will benefit Eureka's citizens who like to enjoy the parks," said Lee Ann Cedar, of Eureka's Recreation and Parks Division.

Another partnership will help provide a new boat launch ramp on the Meramec River. Plans are being developed with the Missouri Department of Conservation to provide a boat ramp, rest room and parking area to allow river access.

A key cooperative effort to develop the park is with the Missouri Department of Transportation (MoDOT). Through MoDOT, DNR received a federal grant that will partially fund a project to survey and reconstruct the original Route 66 through the park. Part of this money also will be used to repair and renovate the Galley West building for use as a visitor center, and to provide interpretive displays.

The original route and the building with its displays are key components for making the park a popular national tourist destination for Route 66 enthusiasts.



With easy access from the St. Louis metropolitan area, this family takes advantage of one of the park's hiking trails. Visitors on a walking tour of the park may spot flocks of geese, turkey, deer and more than 40 species of birds.

Route 66 was designed as a federal highway in 1926 and it occupies a special place in American popular culture and history. Spanning some of the most remote country in the United States, Route 66's fame is primarily due to its role in social changes taking place during the first half of the 20th century. The highway has come to represent American mobility, independence and spirit of adventure. It became one of the greatest migration routes in our country's history and has been labeled by author John Steinbeck, as the "Mother Road." U.S. Highway 66, more popularly known as Route 66, is significant as the nation's first fully paved highway that reduced the travel distance between the Midwest and Pacific Coast by more than 200 miles and several hours.

To drive Route 66 during its heyday was to experience both large cities and small towns in rural America. Gas stations were not that plentiful and speed limits very low. Children could easily get their parents to stop several times so that they could see the Buffalo Ranch or the roadside shop that had crocodiles and snakes for their viewing and entertainment. Many people have fond memories of childhood vacations along the highways and byways of Route 66. Route 66 State Park will strive to keep some of those memories alive through its displays, memorabilia, and volunteers who will share their knowledge of old Route 66 and their adventures as they traveled the "Mother Road."



There is no better place to evoke memories of life on the "Mother Road" than this refurbished building that houses Route 66 State Park's exhibit hall and administrative offices.

To achieve this, park staff are working with many Route 66 enthusiasts throughout the United States and abroad. A special partnership is being formed with the Route 66 Association of Missouri and its founder, Jim Powell. In addition to working with park staff on displays, association members have indicated that they will be donating memorabilia and will be willing to donate time at the park's visitor center.

Along with displays about Route 66, ideas being considered for the visitor center include a Route 66 gift shop and a cafe similar to those commonly found along the highway during its heyday. A special event area that will be developed in the park can be used for many programs and festivals, including events such as classic car shows.

"We are not forgetting the area's past, and what we can offer visitors who come here."



A postcard from the 1950s shows the building in its previous life as Steiny's Inn, then one of St. Louis' most popular roadside restaurants. Postcard from "The Missouri U.S. 66 Tour Book".

met with great enthusiasm and anticipation.

The transformation from environmental tragedy to successful state park is not yet complete, but the Missouri Department of Natural Resources is well on its way to creating an area where visitors can enjoy recreational opportunities as well as experience nature and nostalgia.

For more information on Route 66 State Park, contact the park directly at (636) 938-7198 or DNR toll free at 1-800-334-6946 (voice) or 1-800-379-2419 (TDD).

Diane Warhover is the superintendent of Route 66 State Park, within DNR's Division of State Parks.

"The future looks bright for Route 66 State Park," according to Mahfood. "We have many exciting plans for the future. Partnering with surrounding towns and school districts will continue to provide opportunities for Route 66 State Park to grow and meet the environmental education and recreational needs of Missouri residents."

The staff of Route 66 State Park have established contact with the Rockwood School District and the St. Louis City School District. Naturalist programs and other programs have already begun and are being